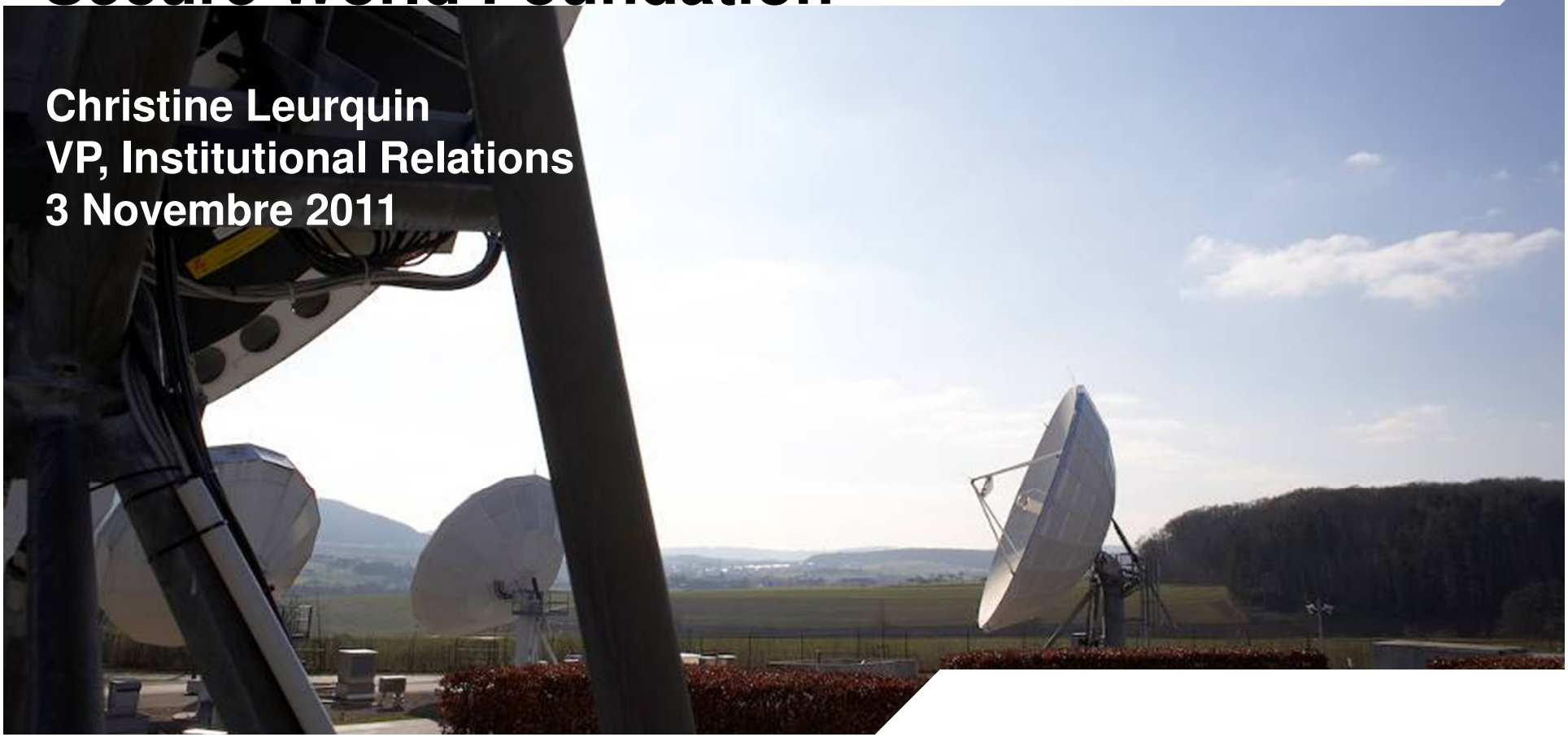
Introduction to the Space Data Association

Secure World Foundation



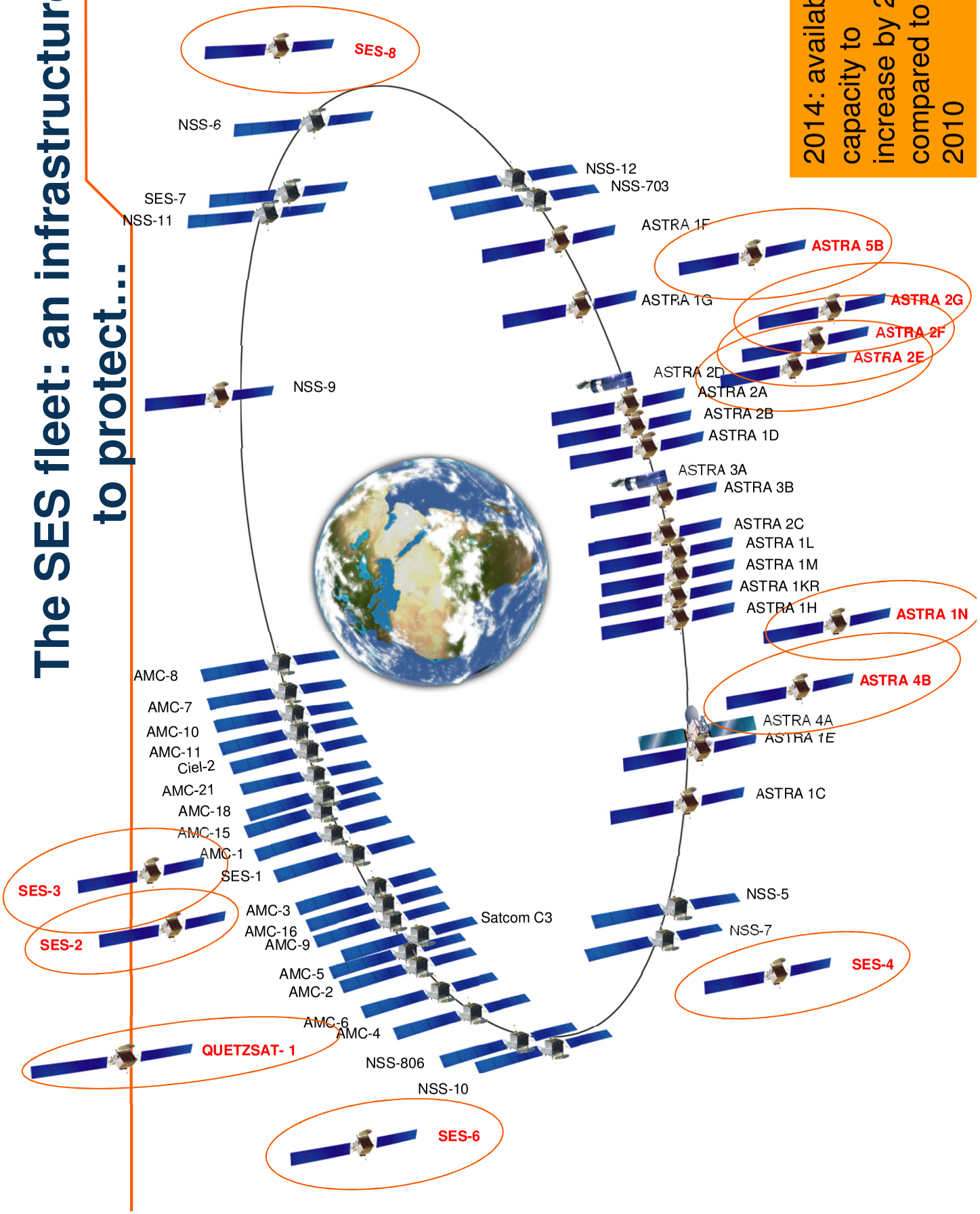
Christine Leurquin
VP, Institutional Relations
3 Novembre 2011

SES – who we are

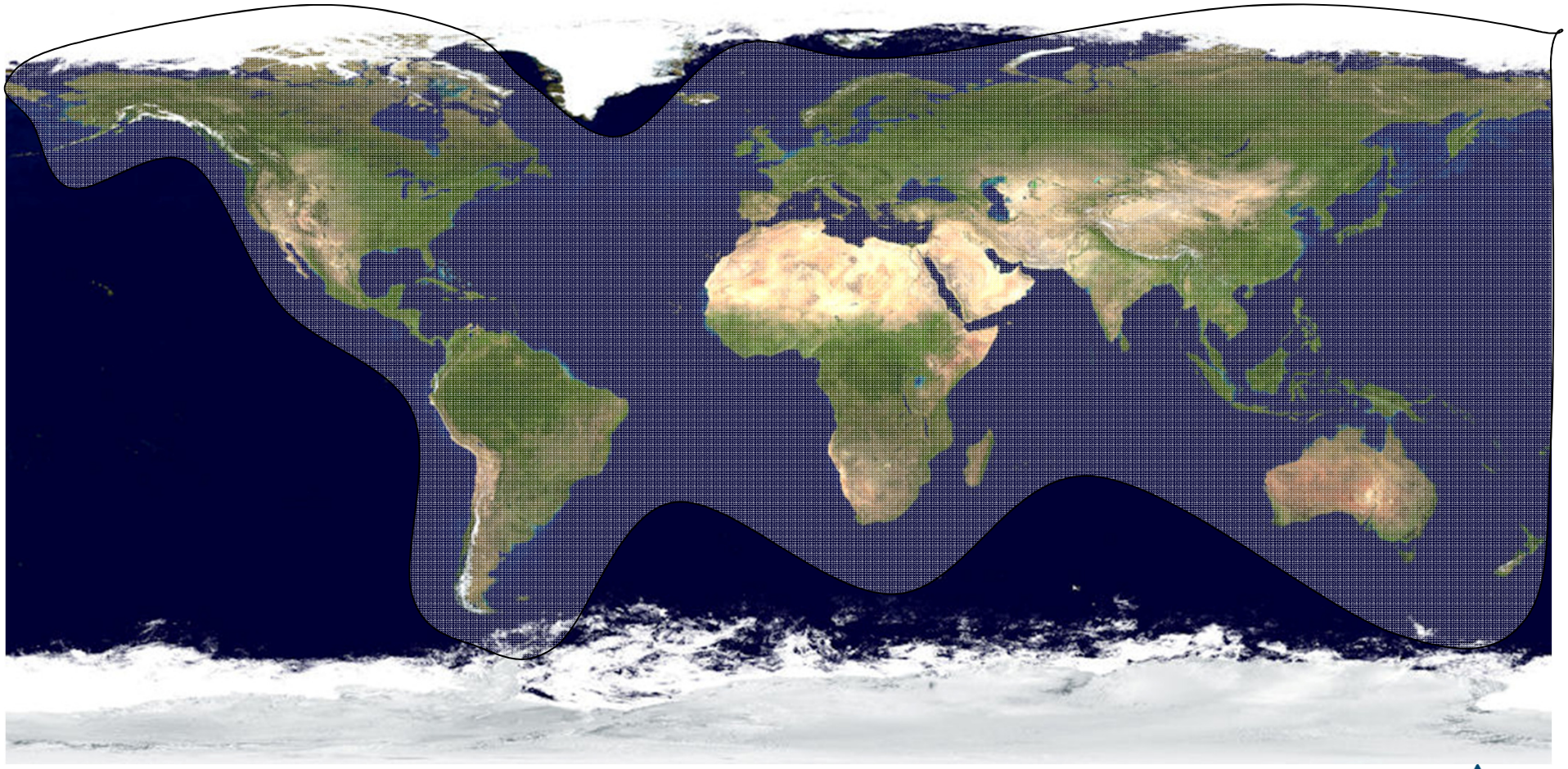
- The world's pre-eminent satellite group
- 45 satellites: global fleet with optimal look angles and comprehensive landmass coverage, operated through our
  - fully-owned operating companies SES ASTRA, SES WORLD SKIES
  - Partially-owned CIEL, QuetzSat, O3b Networks
- Premier provider of transmission capacity
  - media distribution
  - connectivity
- Advanced satellite-based platforms and services for
  - media and government organisations
- Created in 1985 and based in Luxembourg, Europe
- 1,269 staff around the world
- Traded on Euronext Paris and Luxembourg stock exchanges (SESG)

The SES fleet: an infrastructure to protect...

2014: available capacity to increase by 23% compared to YE 2010

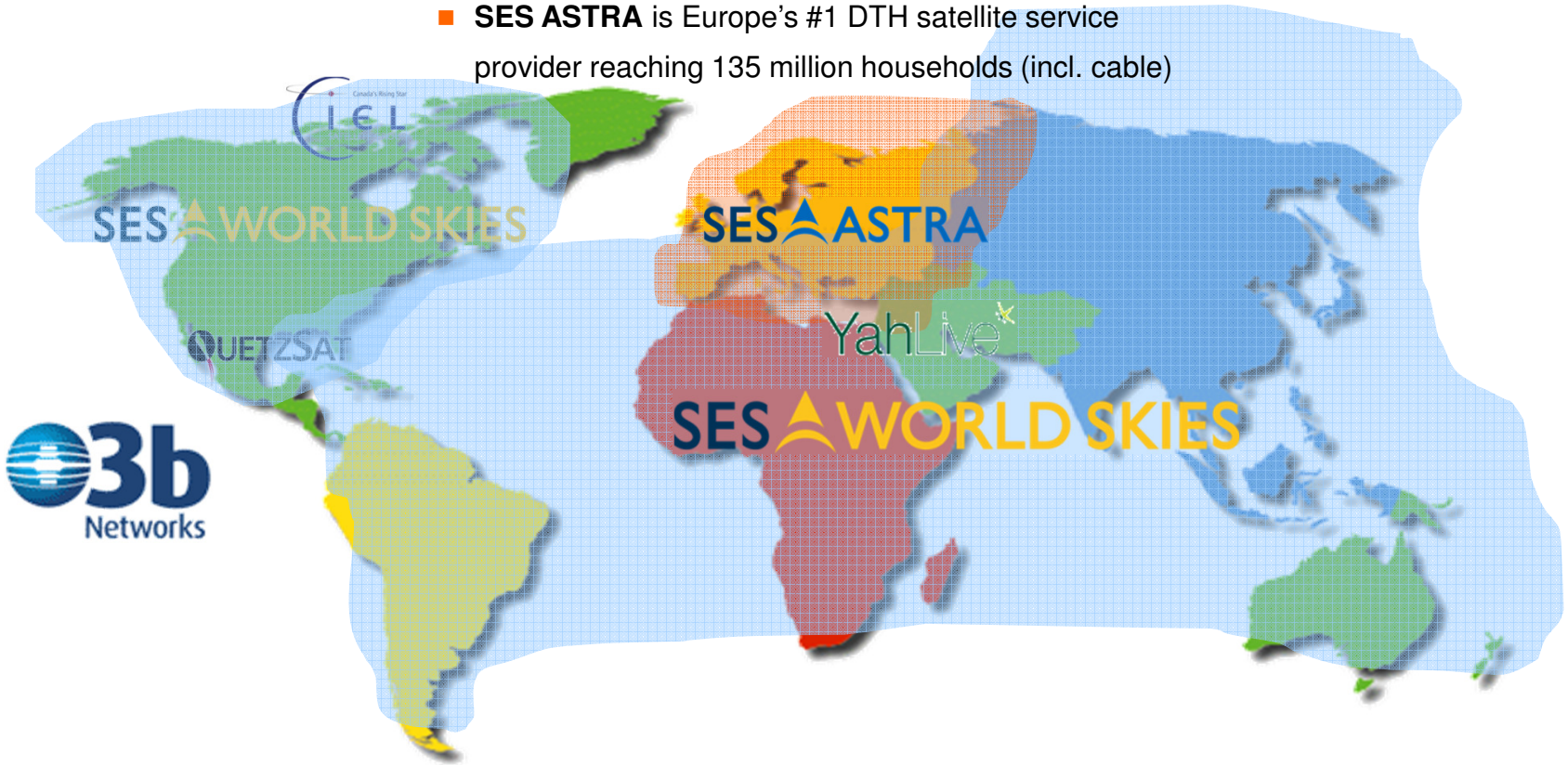


... which gives SES unrivalled global coverage...



Global reach, regional market focus

- **SES ASTRA** is Europe's #1 DTH satellite service provider reaching 135 million households (incl. cable)



- SES WORLD SKIES is a major player in broadcasting for US cable services reaching some 80 million US households.
- **SES WORLD SKIES** is also the premier provider of satellite communications services with more than 250 customers based in 80 countries. SES WORLD SKIES reaches 145 million DTH/cable households in the world.

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What is the Space Data Association?

- **The Space Data Association (SDA) is a not-for-profit association formed by and for satellite operators to provide reliable and efficient data-sharing critical to the safety and integrity of the space environment and the Radio Frequency spectrum.**

- **The SDA was founded by** Inmarsat**,** Intelsat **and** SES **— three of the leading global satellite communications companies. These three companies, plus** Eutelsat**, now form the Executive Board of the SDA.**

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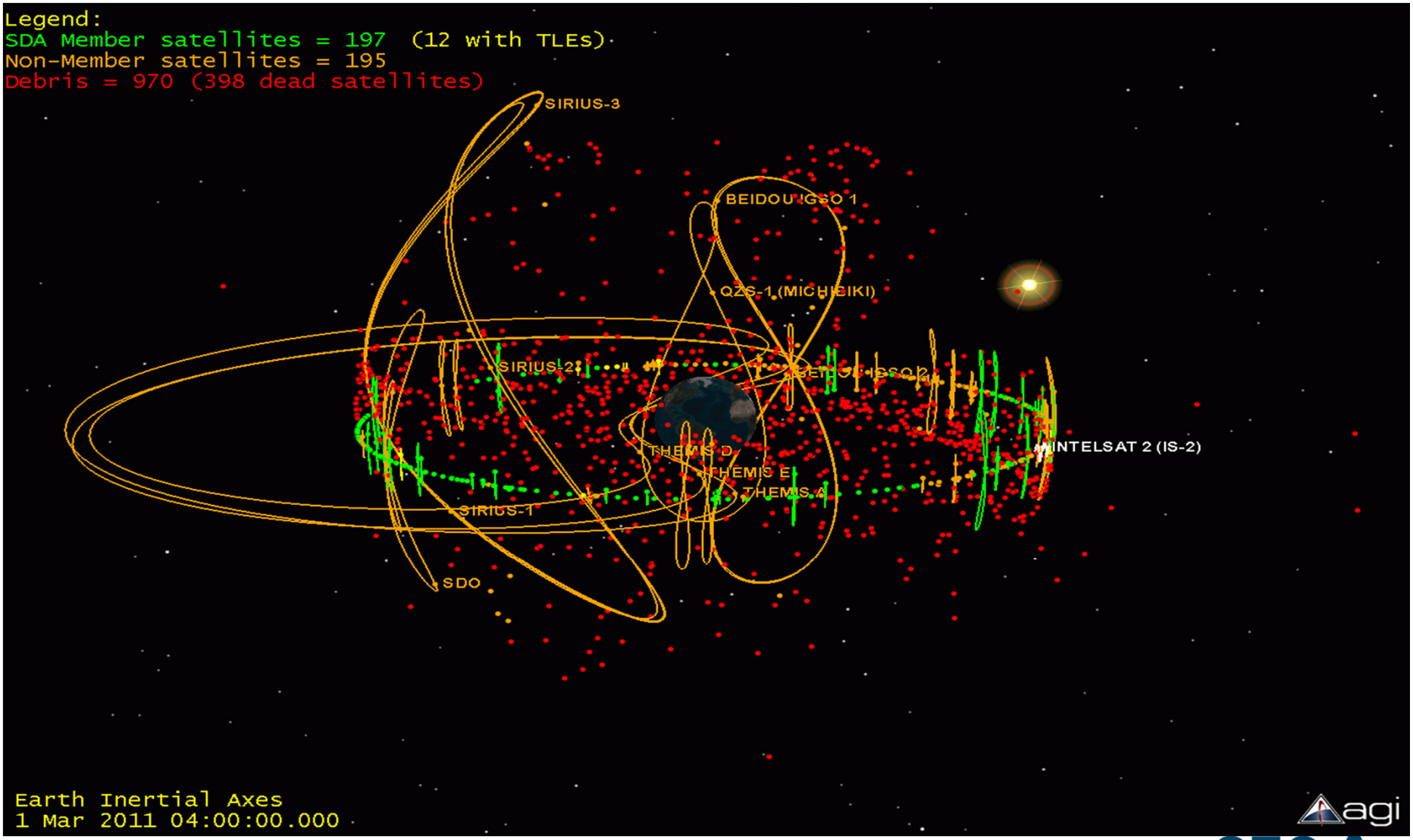
In-Orbit objects as of March 2011



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Shared Motivations for SDA's Creation

- **Enhance "Safety of flight"**
  - *Definition: The condition where satellites are positioned and operated in a manner that preserves their long-term operational viability and the preservation of the orbital regime's involved*
- **Efficient, timely, accurate conjunction assessments**
  - Reduce false alarms, missed events
  - Minimize Member time and resources devoted to Conjunction Assessment
- **Common SSA / Format Conversions / Data Repository**
  - Minimize confusion, potential for conflicting decisions
- **RFI Geolocation and Resolution Support**
  - More rapidly find and address interference sources
- **Encourage evolution of best practices for Members**

Conclusion: SDA Enhances its Members' Satellite Operations

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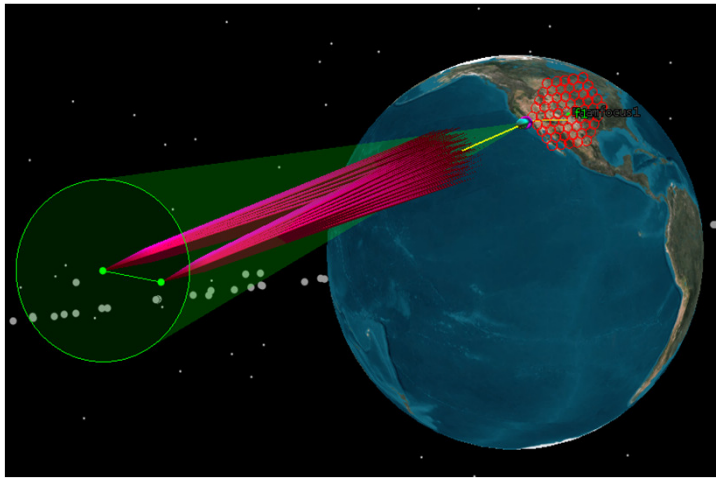
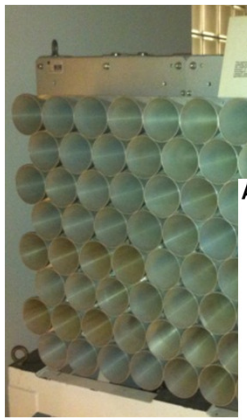
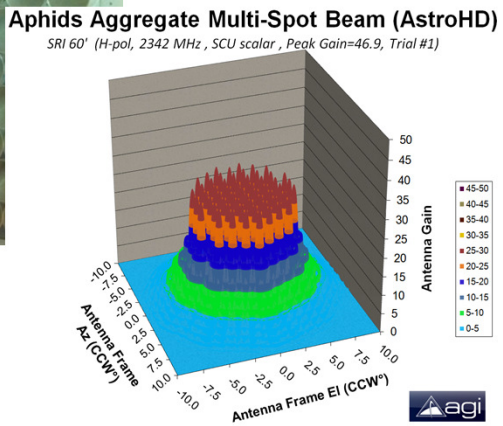
SDA and Geolocation

- Without SDA
  - Multiple phone calls required
  - Hours/days required to locate viable solution set and data
  - Data formats = anyone's guess
- With SDA
  - Solution sets immediately available
  - All necessary data centralized and in consistent format
  - Better data = more accurate results

Geolocation error reduced two orders of magnitude using SDA-on-SDA quality ephemeris







SDA enables faster, more accurate geolocation results

SDA Charter

- Seek and facilitate improvements in the safety and integrity of satellite operations through wider and improved coordination between satellite operators

- Seek and facilitate improved management of the shared resources of the Space Environment and the Radio Frequency Spectrum

SDA Status

- SDA established as a legal entity in the Isle of Man
  - Provides necessary legal framework for sharing and protection of data
- Space Data Center (SDC) system built by Analytical Graphics, Inc. (AGI)
  - System has now achieved Full Operations Capability, providing Conjunction Assessment service to its members
- Growing membership of
  - Approximately a dozen satellite operators from Geosynchronous and LEO orbital regimes
  - Conjunction Assessment Processing for more than 65% of all GEO satellites

Multinational, open to all space operators

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Space Data Center (SDC)

- SDC – Three Key Mission Areas:
  - Collision avoidance monitoring (Conjunction Assessment)/ Manoeuvre Planning Validation / Flight Safety
  - Radio Frequency Interference mitigation / Geolocation support
  - Contact information (operations center) for SDA Member objects
- SDC reliable and secure operation:
  - Tertiary, geographically separated redundancy
  - High level data security and encryption
  - Best practice Information Assurance (IA) based on standards for high level computing systems

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How does SDA Protect Member Data?

- Strict legal agreements between Members and SDA
  - Defines permitted uses for SDC data/products
  - Prohibits misuse of SDC data/products
    - Retransmission to third parties prohibited
    - Obligations for member data contribution
  - Legal liability issues are addressed by enforceable contract

- Multiple technical / security controls within SDC

Potential Future SDA Capabilities

- Collect, process, store & disseminate RF Interference (RFI) details to support investigation
- Automatically provide solution sets for performance of geolocation measurements
- Develop & maintain RFI mitigation capabilities, procedures and techniques to ensure continuity of operations
- Collate and disseminate Space Weather data
- Host databases of deployed equipment for industry's RFI 'Carrier ID' project

Contacts – Directors of the SDA

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Thank you!

Visit www.ses.com

BACK UP SLIDES

Permitted & Prohibited Uses

- Permitted Uses:
  - Operational support, including Safety of Flight
  - RFI resolution of actual harmful interference, including at ITU
  - Support for insurance underwriting
  - As legally required by national regulatory authorities

- Prohibited Uses:
  - Any commercial purposes (sales, planning, marketing, etc.)
  - Securing orbital-spectrum rights
  - Transmittal to 3rd parties (except for Safety of Flight)
  - Any other use that is not a Permitted Use

These conditions are enforced through the legally binding agreements

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Why is data sharing through the SDA important?

- Data from other sources has proven to be unreliable
  - TLEs for conjunction assessment are insufficient
- Operators' own data is one of the best sources
  - Facilitate operator-to-operator sharing
- SDC can ensure common data formats/data is current
  - Automated conversion of ephemerides to common format
- SDA can help operators validate data
  - Periodic calibration of data
- Data automatically available
  - Checks on data validity
  - Available on system, no manual intervention

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How is the SDA funded?

- Until recently, the founding members (SES, Intelsat and Inmarsat) have supported all costs
- Now that Full Operations Capability has been reached, each member is being charged an annual fee
  - Fees are maintained low to attract members and in any case, are only intended to cover costs
  - Short fall will likely continue to be covered by Executive Members
- Funding will be at a level to ensure a cash-positive balance though not-for-profit and will anticipate future development

What data will be shared?

- Data sharing will be defined by the type of service:
  - **Points of Contact**: Operations points of contact
  - **Conjunction Assessment (CA)**: Orbital data and manoeuvre plans
  - **RF Data Sharing**: RF data including sat. config., ref. carriers, etc.
  - **RFI Alert**: RFI event reports
  - **Enhanced Services**: All of above plus agreement to share data with approved 3rd parties in return for access to enhanced services (geolocations, other data sources)
- Third party access to data (Enhanced Services only) will be strictly controlled and determined by the SDA
- All members must participate in Points of Contact and Conjunction Assessment but can choose whether to participate in other services
- Participation in a service requires Member to provide associated data

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